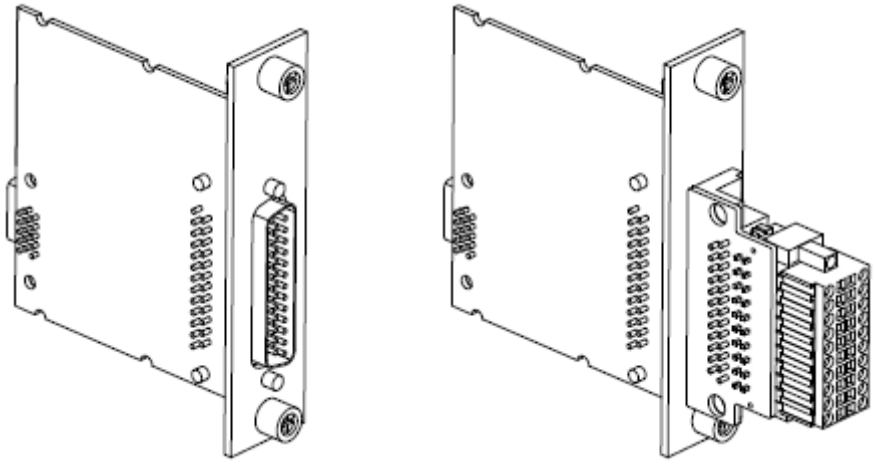
DATASHEET

# MT E712

## 4-Channel, ±25mA, 16 Bit,  180kS/s, Analog Input Module



- 4 channels, 180kS/s current input
- DSUB or push-in spring terminal connectivity;
- 250 Vrms, CAT II, channel- to-earth isolation

  (Spring Terminal);60 VDC, CAT I, channel-to-earth isolation (DSUB)
- -40 ℃ to 70 ℃ operating range, 5 g vibration, 50 g shock

The MT E712 is a current input module with 4 channels for high performance control and monitoring applicatons. Each channel provides a ±25mA measurement range at a 16-bit resolution,and a 180kS/s maximum sampling rate. To protect against signal transients, the MT E712 includes a channel-to-earth ground double- isolation barrier (250 $V_{rms}$ isolation) for safety and noise immunity.There are two connector options for the MT E712—a 20-position spring-terminal connector and a 25-position DSUB connector.

MANGOTREE

# MT E Series Overview

MT provides more than 20 E Series modules for measurement, control, and communication applications. E Series modules can connect to any sensor or bus and allow for high-accuracy measurements that meet the demands of advanced data acquisition and control applications.

- Measurement-specific signal conditioning that connects to an array of sensors and signals
- Isolation options such as bank-to-bank, channel-to-channel, and channel-to-earth ground
- -40 ℃ to 70 ℃ temperature range to meet a variety of application and environmental needs
- Hot-swappable

The majority of E Series modules are supported in both RobustRIO and FlexDAQ platforms and you can move modules from one platform to the other with no modification.

## RobustRIO

RobustRIO combines an open-embedded architecture with small size, extreme ruggedness, and E Series modules in a platform powered by the Redefinable I/O (RIO) architecture. Each system contains an FPGA for custom timing, triggering, and processing with a wide array of available modular I/O to meet any embedded application requirement.

## FlexDAQ

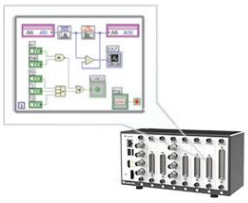
FlexDAQ is a portable, rugged data acquisition platform that integrates connectivity, data acquisition, and signal conditioning into modular I/O for directly interfacing to any sensor or signal. Using FlexDAQ with LabVIEW, you can easily customize how you acquire, analyze, visualize, and manage your measurement data.

# Software

**LabVIEW Professional Development System for Windows**

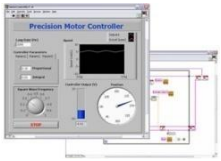
- Use advanced software tools for large project development
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables, and MSI installers

**LabVIEW FPGA Module**



- Design FPGA applications for MT RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx IP generator functions

**LabVIEW Real-Time Module**

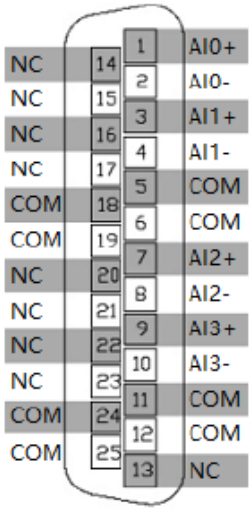



- Design deterministic real-time applications with LabVIEW graphical programming
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of multicore CPUs or set processor affinity manually
- Take advantage of real-time OS, development and debugging support, and board support

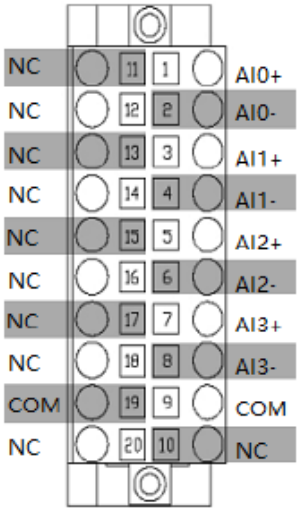
# MT E712 Connectivity

Pin definition of DSUB connector and Spring Terminal connector.

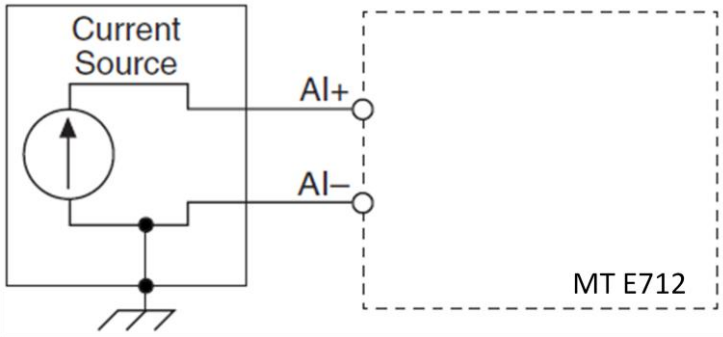
DSUB



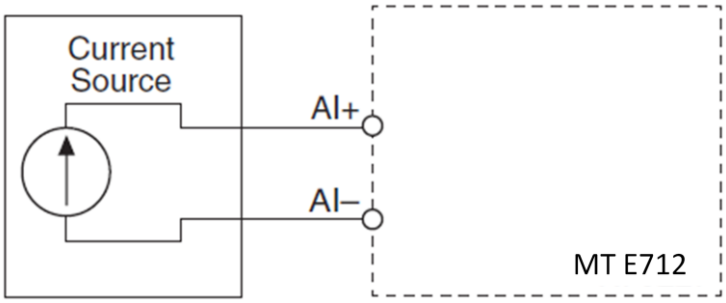

Spring Terminal



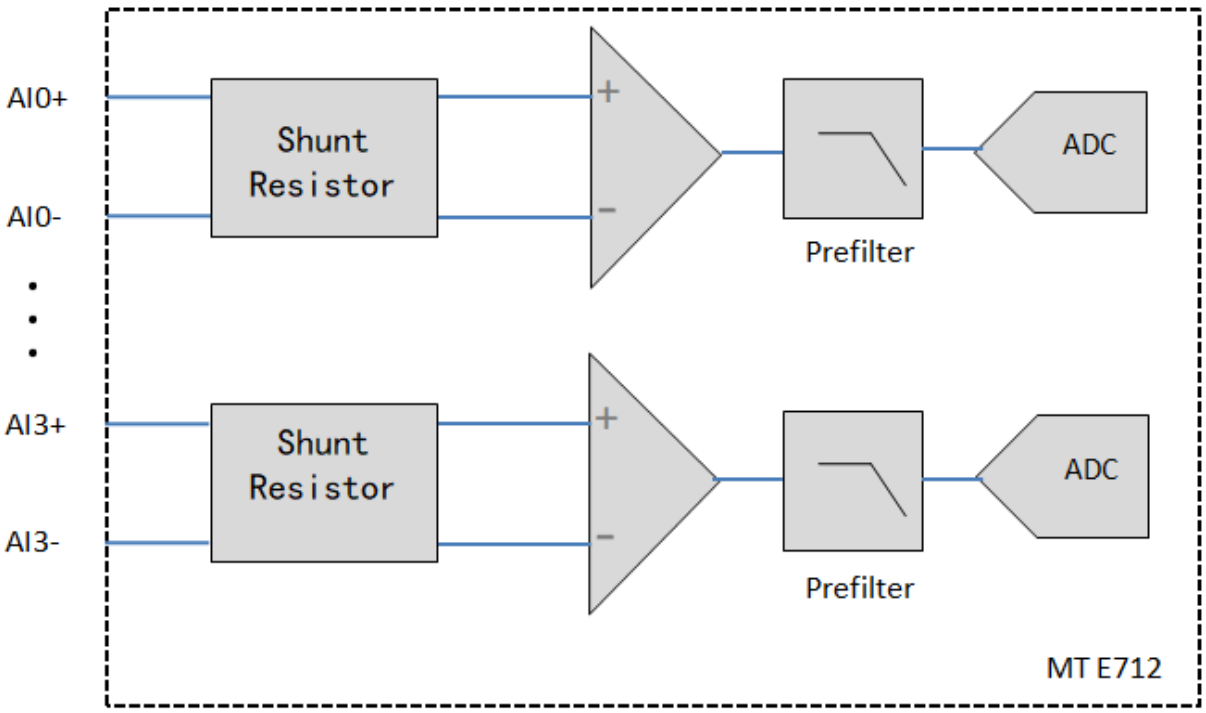

Connecting a grounded current source to the MT E712.




Connecting a floating current source to the MT E712.



# MT E712 Circuitry




Input signals on each channel are buffered, conditioned, and then sampled by an ADC.

Each AI channel provides an independent signal path and ADC, enabling you to sample all channels simultaneously.

# MT E712 Specifications

The following specifications are typical for the range -40 ℃ to 70 ℃ unless otherwise noted.

**Caution** Do not operate the MT E712 in a manner not specified in this document. product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to NI for repair.

**Caution** The input terminals of this device are not protected from electromagnetic interference. As a result, this device may experience reduced measurement accuracy or other temporary performance degradation when connected cables are routed in an environment with radiated or conducted radio frequency electromagnetic interference. To limit radiated emissions and to ensure that this device functions within specifications in its operational electromagnetic environment, take precautions when designing, selecting, and installing measurement probes and cables.

# Input Characteristics

| | |
|---|---|
| Number of channels | 4 analog input channels |
| ADC resolution | 16 bits |
| Type of ADC | Successive approximation register (SAR) |
| Input voltage ranges | ±25mA |
| Overvoltage protection | ±30 V |
| Sample mode | Simulaneous |
| Sample rate | 180 kS/s maximum per channel |

**Table 1.** Accuracy

| | Measurement Conditions | Percent of Reading (Gain Error) | Percent of Range (Offset Error) |
|---|---|---|---|
| Calibrated | Maximum (-40 ℃ to 70 ℃) | ±0.20% | ±0.09% |
| | Typical (25 ℃, ±5 ℃) | ±0.08% | ±0.03% |

| | |
|---|---|
| Stability | |
| Gain drift | ±17 ppm/℃ |
| Offset drift | 86nA/℃ |
| CMRR | 120 dB minimum |
| -3 dB bandwidth | >85kHz |
| Input impedance(AI+ to AI-) | 12 mΩ |
| Input noise | |
| RMS | 1LSBrms |
| Peak-toPeak | 7LSB |
| Crosstalk(at 1 kHz) | -90 dB |
| Settling time (to 2 LSBs) | 5.5us |

# Power Requirements

| | |
|---|---|
| Power consumption from chassis | 730 mW maximum |
| Thermal dissipation (at 70 ℃) | 1230 mW maximum |

# Safety Voltages

Connect only voltages that are within the following limits:

## MT E712 with Spring Terminal Isolation Voltages

| | |
|---|---|
| Channel-to-channel | None |
| Channel-to-earth ground | |
| Continuous | 250 Vrms, Measurement Category II |
| Withstand up to 4,000 m | 3,000 Vrms, verified by a 5 s dielectric withstand test |

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

## MT E712 with DSUB Safety Voltages

| | |
|---|---|
| Isolation | |
| Channel-to-COM | None |
| Channel-to-earth ground | |
| Continuous | 60 VDC, Measurement Category I |
| Withstand up to 2,000 m | 1,000 Vrms, verified by a 5 s dielectric withstand test |

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low- voltage sources, and electronics.

# CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

# Shock and Vibration

To meet these specifications, you must panel mount the system.

| | |
|---|---|
| Operating vibration | |
| Random (IEC 60068-2-64) | 5 $g_{rms}$, 10 Hz to 500 Hz |
| Sinusoidal (IEC 60068-2-6) | 5 g, 10 Hz to 500 Hz |
| Operating shock (IEC 60068-2-27) | 30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations |

# Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

| | |
|---|---|
| Operating temperature (IEC 60068-2-1, IEC 60068-2-2) | -40 ℃ to 70 ℃ |
| Storage temperature (IEC 60068-2-1, IEC 60068-2-2) | -40 ℃ to 85 ℃ |
| Ingress protection | IP40 |
| Operating humidity (IEC 60068-2-78) | 10% RH to 90% RH, noncondensing Storage |
| humidity (IEC 60068-2-78) | 5% RH to 95% RH, noncondensing Pollution |
| Degree | 2 |
| Maximum altitude | |
| For MT E712 with spring terminal | 4,000 m |
| For MT E712 with DSUB | 2,000 m |

Indoor use only.